Natural Resources Management Plan
and
Environmental Assessment

Sequoia & Kings Canyon National Parks
California

JUNE 1981 Revision

Prepared by
Sequoia & Kings Canyon National Parks

NATIONAL PARK SERVICE / U.S. DEPARTMENT OF THE INTERIOR

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NATURAL RESOURCES MANAGEMENT PLAN

Sequoia and Kings Canyon National Parks
California

JUNE 1981 REVISION

Prepared by

Sequoia and Kings Canyon National Parks
National Park Service
Department of the Interior

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SUMMARY

Natural Resources Management Plan
Sequoia and Kings Canyon National Parks
1981 Revision

INTRODUCTION

This Natural Resources Management Plan (NRMP) is a revision of the November 1976 plan. As in the 1976 NRMP, it combines research and management projects designed to perpetuate the Parks' ecosystems. It deals with broad resource topics such as vegetation, wildlife, fire ecology, air/water quality, impact of human use, and contains numerous minor modifications and additions.

An Environmental Assessment (EA) accompanied the 1976 NRMP, and it continues to serve as an important reference source for this revised NRMP. Also, a Management Program (MP) was prepared as a separate addendum to the NRMP and EA. Again, under separate cover, a revised MP has been prepared in 1981. Copies of this internal working document are available for reference use from the Superintendent of Sequoia and Kings Canyon National Parks.

PROPOSED ACTIONS

Specific management actions are proposed as follows:

1). Maintain native plant species composition, control exotic infestation and disease;

2). integrate practices of allowing naturally occurring fires, prescribed fire, and suppression;

3). return sequoia groves to natural conditions;

4). minimize bear/human conflicts, control woodrats, ground squirrels, and exotic beavers;

5). continue fish stocking at 1974 levels and study fisheries practices;

6). restore meadows to natural conditions and regulate grazing;

7). ration backcountry and cave use;

8). air and water quality monitoring.

In addition, research will be conducted on related resource areas, such as vegetation and wildlife, fire ecology, air and water quality, and human use of the wilderness.

ENVIRONMENTAL IMPACTS OF PROPOSED ACTIONS

It was determined through public and National Park Service review of the 1976 NRMP, EA, and MP, that proposed actions lacked potential to cause significant environmental impacts on the human environment. Following Council of Environmental Quality's (CEQ) regulations, a Negative Declaration was prepared and signed on November 17, 1976. Proposed actions in this revision represent minor modifications to the 1976 plan.

Impacts of proposed actions in this revision continue to focus on restoration of natural conditions and ecological relationships and prevention of environmental deterioration from human activities. Management actions may entail short-term uses--emplacements, such as exclosures, and manipulation, such as relocation of problem bears. Human use may be regulated, e.g., in some meadow areas, caves, and when prescribed fires are occurring, but rehabilitative measures will contribute to enhancement of visitor experience in the long run.

In addition to provisions of the National Environmental Policy Act, projects proposed here comply with the National Historic Preservation Act, the Clean Air Act as amended in 1977, and the Endangered Species Act. Therefore, no further consultation of environmental impacts is necessary prior to carrying out proposed projects. They will begin when funds become available.

Superintendent, Sequoia and Kings Canyon — July 16, 1981 (date)

Regional Director, Western Region — Sept 19, 1981 (date)

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THE PLAN

INTRODUCTION

An Environmental Assessment (EA) accompanied the 1976 Natural Resources Management Plan (NRMP) for Sequoia and Kings Canyon National Parks. That EA provides valuable background information for this revised NRMP. Readers unfamiliar with the natural resources of these Parks are especially referred to the EA's section, Description of the Environment. That section includes summary descriptions of geology, water, climate, ecosystems, wildlife, archeology, history, land classification, human use and development, and surrounding land use patterns.

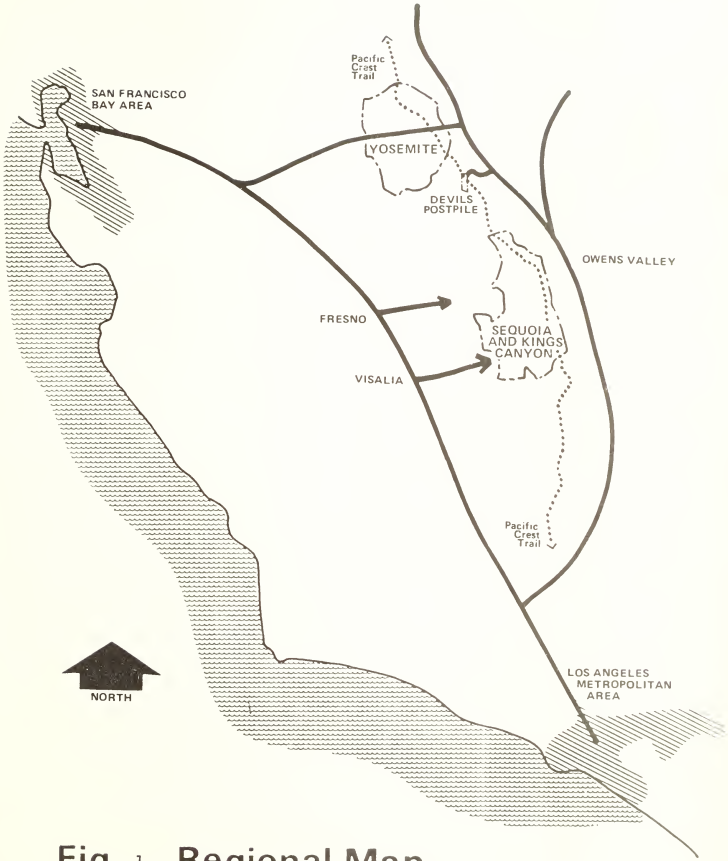


Fig 1. Regional Map

MANAGEMENT OBJECTIVES

Natural resources in Sequoia and Kings Canyon National Parks constitute extensive and superlative examples of the biota and physiography of central and southern Sierra Nevada. Historic uses and management practices have altered some natural ecological processes. Growing demand for increased recreational use of the area further threatens these natural processes. However, efforts will continue to conserve these diverse resources for the enjoyment of succeeding generations.

This revised natural resources management plan seeks to allow natural ecological processes to dictate the character of the environment. It provides for active management programs where necessary to counteract influences of management and use of the Parks. The plan consists of research, to understand the ecological relationships involved; resource surveillance, to monitor influences of man on the environment; and active management programs, to correct or mitigate these unnatural influences as they are identified.

This plan is designed to fullfill applicable Congressional mandates for a natural category park area. Authority and guidance for various aspects of the plan are primarily found in Management Policies of the National Park Service, enabling legislation for Parks, and Title 36, Code of Federal Regulations. Plan actions are consistent with objectives presented in the Statement for Management for Sequoia and Kings Canyon National Parks.

The following resource management objectives, contained in the Statement for Management, lead to desired conditions of a natural park environment that would have naturally evolved had not European man disturbed natural processes. They provide the direction for projects within the plan.

Restore and/or maintain the natural ecosystems of these Parks so they may operate essentially unimpaired by human interference.

-- Encourage and support an active research program designed to provide management with decision assistance in all aspects of planning, development, and management.

-- Perpetuate wildlife populations in a natural environment while protecting visitors from harm.

-- Give special consideration to protection of those rare, threatened, or endangered plant and/or animal species found in the Parks.

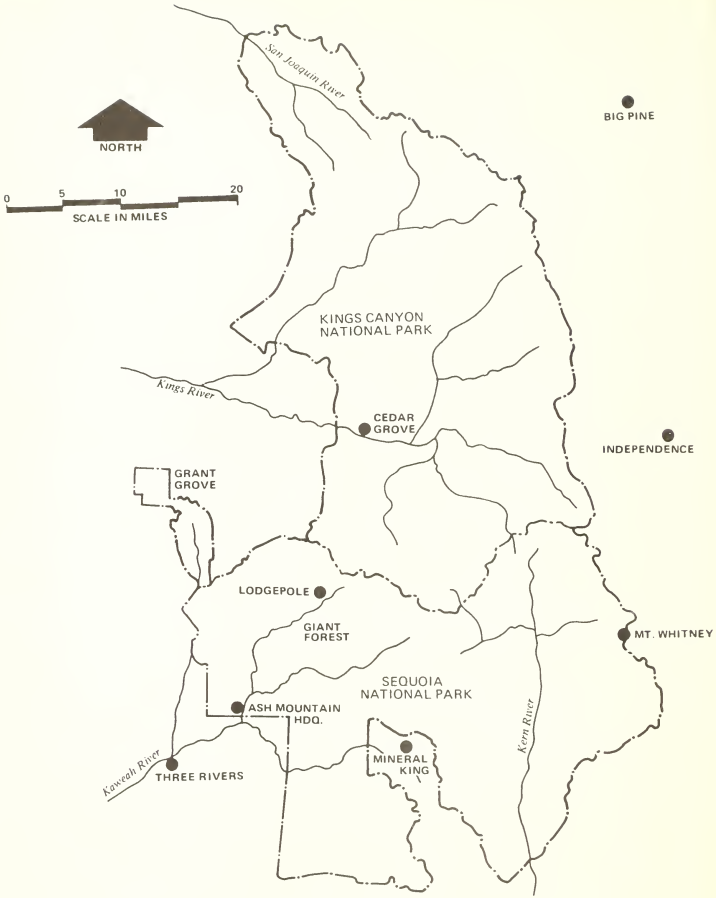


Fig 2. Sequoia and Kings Canyon

-- Allow naturally occurring fires to fulfill their role to the fullest possible extent with particular attention given to sequoia groves.

-- Preserve and maintain natural sequoia groves to perpetuate the prime scenic resource.

-- Limit helicopter use in the backcountry to the minimum necessary to meet needs of management to achieve the purpose of the area.

-- Restore altered natural ecosystems as nearly as possible to conditions they would be in today had natural processes not been disturbed.

-- Reduce unnatural pollution levels to a point where natural resources can be viewed unimpaired by visitors.

-- Monitor impacts of air and water pollution on natural resources.

-- Provide quality opportunities for visitor understanding, compatible use, and enjoyment of the Parks' resources.

-- Eliminate all nonconforming uses within these Parks.

-- Complete assessment of impacts of the Kaweah River diversion on park resources and make recommendations to Congress on extension or denial of permit to continue diverting water from the river.

-- Cooperate with other agencies and outside interests in development of plans and major management programs.

-- Maintain a professional level of visitor and employee protection through effective programs in law enforcement, safety management, and public health.

-- Limit National Park Service and concession development to that necessary and appropriate for public use and enjoyment of these Parks, and eliminate or relocate facilities that intrude on primary resources.

MANAGEMENT ACTIONS

Natural resources management actions now underway, and those proposed follow:

I. Vegetation Management

A. Reestablish and maintain native and threatened and endangered plant species composition:

1. Threatened and Endangered Plants

No comprehensive field survey of proposed threatened, or endangered plant species has been conducted in these Parks. The California Native Plant Society has, however, compiled and mapped all known collections of proposed threatened and endangered plant species statewide. As of 1979, none of these species has yet been officially classified by Congress.

The species listed in Table 1 are recommended for threatened or endangered status by the California Native Plant Society and have been recorded for the Parks. Field surveys will be conducted to determine their location and habitat requirements and the effect of fire on these plants.

Inventories of threatened and endangered plant species may result in recommendations to protect and/or reestablish these plants. Any plantings will be preceded by determination of species status, as threatened or endangered, and site selection based on impaction by human activities. Planting will be coordinated with the general permit procedures of the Endangered Species Act of 1973.

Table 1.
Table of Plant species, within the Parks, recommended for threatened or endangered status by California Native Plant Society.

Species Name and Author	Elevation Range (from Munz)	Vegetation Type (from Munz)
Alpine/Subalpine Upper Mixed Conifer		
1. *Arabis pygmaea* Roll	8,500 to 11,000 ft	Dry flats, subalpine forests
2. *Asplenium septentrionale* (L.) Hoffm.	apx. 11,000 ft	Rocks
3. *Astragalus kentrophyta* Gray var. *danaus* Barneby	11,250 to 11,500 ft	Alpine fell fields
4. *Astragulus ravenii*	apx. 11,250 ft	Open stony slopes, alpine fell fields
5. *Delphinium inopinum* (Jeps.) Lewis & Epl.	5,000 to 8,000 ft	Open places, yellow pine forest
6. *Dicentra nevadensis* (treated as subspecies by Munz: *D. formosa* ssp. *nevadensis*	7,500 to 10,000 ft	Moist places, lodgepole to subalpine forests
7. *Draba cruciata* Pays var. *integrifolia* Hitch. & Sharsm.	10,000 to 12,400 ft	Alpine fell fields
8. *Eriogonum polypodum* Small	8,000 to 10,500 ft	Dry sand flats
9. *Erythronium grandiflorum* Pursh. ssp. *pusaterii* Munz & Howell	8,000 to 9,000 ft	Open rocky soils
10. *Hackelia sharsmithii* Jtn.	10,750 to 12,000 ft	Shaded spots in the shelter of rocks in the subalpine forest of alpine fell field plant communities

Species Name and Author	Elevation Range (from Munz)	Vegetation Type (from Munz)
11. *Phacelia orogeneo* Brand	8,500 to 10,300 ft	Meadows, subalpine forests
12. *Raillardella muirii* Gray	4,000 to 7,000 ft	Open slopes, yellow pine forests
13. *Ribes tularense* Fedde	5,000 to 6,000 ft	Yellow pine forest, red fir forest
14. *Streptanthus gracillis*	10,000 to 11,000 ft	Dry slopes of disintegrated granite subalpine forest
15. *Draba cruciata* var. *cruciata* Jeps.	9,000 to 10,000 ft	Subalpine forests
Sequoia Mixed-Conifer		
1. *Streptanthus fenestratus* (Greene) J.T. Howell	4,000 ft	Open exposed sandy sites, higher valley floors or gently sloping hillsides. Flat to south-facing open slopes, yellow pine forests
2. *Pityopus californicus*	1,000 to 5,000 ft	Deep shade, yellow pine forests, giant sequoia forests
3. *Erigeron aquifolius* Hall	5,000 to 7,000 ft	Dry ridges, yellow pine forests, red fir forests
Chaparral/Oak Woodland		
1. *Angelica calli* Mathias & Constance	3,300 to 6,500 ft	Stream banks and other moist places at the edge of woods
2. *Carex tomkinsii* J.T. Howell (1961)	3,200 to 5,500 ft	Rocky canyon walls
3. *Streptanthus farnsworthianus* J.T. Howell	3,000 to 4,000 ft	Gravelly outcrops upper oak-woodland

2. Exotic Plants

The introduction of domestic cattle and sheep by European man brought a variety of Mediterranean annuals and other exotics which have since become the dominant understory vegetation in the chaparral/oak-woodland zone. Most widespread are filaree *(Erodium sp.)*, wild oats *(Avena fatua)*, soft chess *(Bromus mollis)*, and bur clover *(Medicago hispida)*. These species are well adapted to the chaparral/oak-woodland zone and cover virtually all of the area. Studies will be conducted to determine the feasibility of controlling these species and reintroduction of native bunch grasses that were abundant before the arrival of European man.

Scotch thistle *(Onopordum acanthium)*, which probably entered the Parks in Park stock feed, is also exotic. Because of its spiny characteristics and large size, it can become a serious physical barrier. When concentrated, it can exclude wildlife from using an area for grazing. Concern was expressed in 1972 by the Tulare County Department of Agriculture about the potential of the plant to spread to rangeland adjacent to the Park. A cooperative effort was started in 1973 with the Tulare County Department of Agriculture to control the plant by digging it up. Scotch thistle will continue to be removed with assistance from the Tulare County Department of Agriculture. Evaluation will continue to be made as to the potential for future spread.

Probably other exotics, such as foxglove *(Digitalis parparea)* and common mullein *(Verbascum thaspus)* have recently become locally established as weeds throughout the area. These exotics will be monitored to determine their impact on native vegetation.

B. Manage incidence of native insect infestation and disease infections only in developed areas and where it reaches epidemic levels elsewhere, as policy provides:

1. Bark Beetle Management

Native bark beetle *(Dendroctonus spp.)* attack pine, particularly in developed areas where human impact has stressed many trees predisposing them to attack by bark beetles. Because of fungi, such as *Fomes anosus*, mistletoe, mechanical injury, or over-stocking, healthy trees may also be attacked. Detection, removal, and/or chemical treatment of trees infested with

insect pests such as mountain pine beetle *(D. brevicomus)*, red turpentine beetle *(D. valens)* and Ips *(Ips spp.)* will be conducted.

The area subject to control is the area of developments (approximately 1,000 acres). The purpose of the management program is to remove the infested trees before they become a hazard and to provide an aesthetically pleasing environment. Detection and control work is done in spring and fall as needed. Tree removal follows guidelines described under tree hazard abatement. Environmental Protection Agency approved pesticides are applied by trained technicians only.

2. Dwarf Mistletoe

Dwarf mistletoe *(Arcenthobium spp.)* has infected trees on about 1,200 acres in the developed areas of Cedar Grove. Dwarf mistletoe is a parasite which weakens, deforms, and kills pine and fir trees in this area. Fire suppression in Cedar Grove for 70+ years has probably increased the dwarf mistletoe infection well above natural levels because of the overstocked stands of pine and fir that developed with fire exclusion. Direct control by pruning dwarf mistletoe from individual trees to reduce the intensity of the disease, prevent its spread to adjacent forest stands, and removal of infected limbs which pose hazards to public safety will be conducted only in the developed areas of Cedar Grove and Ash Mountain.

3. Fomes Anosus

Fomes anosus is an important pathogen of coniferous trees. It affects many trees, particularly in Giant Forest, Dorst Campground, Grant Grove, and Cedar Grove developed areas and is a source of hazard trees in these areas. Infection centers spread by root contact. Absence of natural fire has caused increased tree density, predisposing these trees to attack by *Fomes anosus*.

Trees will be removed from *Fomes anosus* infection centers and the stumps treated with borax.

C. Control exotic insect and diseases if feasible:

1. Gypsy Moth

Gypsy moth *(Porthetria dispar)* is an exotic that defoliates hardwoods. Gypsy moth will be controlled in developed areas when detected by using attractant-coated funnel traps. This program is conducted with assistance and cooperation of the Fresno and Tulare County Department of Agriculture.

2. White Pine Blister Rust

White pine blister rust *(Cronartium ribicola)* was first detected in the Parks in 1968. A 21,000-acre designated control unit of sequoia groves was established. Infection centers were sanitized by pruning all sugar pine branches within 20 feet of the ground in the immediate vicinity of a found center from 1968 to 1977. A biological evaluation conducted by U.S.F.S. in 1978 indicated that rust is permanently established in Sierran forests and of limited threat to sugar pine. They recommended sanitation of infection centers be discontinued. Consequently, no blister rust control program is proposed. Known blister rust infection centers will be monitored and feasibility of using prescribed fire to control blister rust determined.

D. Continue a program of hazard abatement within developed campgrounds, roadsides, and developed areas:

1. Hazard Tree Removal

About 5,000 live and dead trees have been removed in developed sites and along road sides from 1964 through 1979. These trees die or become structurally unsound as a result of *Armillaria mellea* and other native fungi, mechanical injury, flood, lightning, wind storms, frost damage, and old age. These dead or weakened trees are a serious hazard to people and property in developed areas.

Tree failures causing death, injuries, and about $85,000 in property damage have occured from 1969 through 1979.

The objective of the hazard tree removal program is to establish and maintain a balance which abates tree hazard in areas of high use without unduly manipulating the natural environment. Once the backlog of hazard trees is removed from campgrounds and other developments, about 200 hazard trees will be removed annually. This maintanance level of control will provide a safe environment without unduly manipulating the natural environment.

The following procedures will be used:

a. A standard rating system to assign priority removal values to tree and limb hazards is applied to all developed areas and road units. Priority assignments are reviewed within each developed area every three years and along roads every five years.

b. Hazard tree removal is done in each area according to priority value following the guidelines listed below:

1) All trees are removed in a manner which minimizes damage to remaining vegetation.

2) All logs from felled trees are removed to their natural breaks so that no visible saw cuts remain. Sections that are left must be laid on the ground and not hung up on rocks or other trees.

3) All stumps are flush cut. Stumps in campgrounds and high use areas are cut so that no portion is above ground level. Stumps along roadsides are cut so that no portion is more than three inches above the ground.

4) All cut stump surfaces of living trees are treated with borax, which prevents innoculation by *Fomes annosus*.

5) All limbs are lopped and either scattered or mechanically chipped. Chipped material is spread over denuded sites within developed areas.

c. Accurate maps and records will be maintained of all survey and removal work. In addition, investigation of causes and results of all tree failures will be documented.

Hazard tree removal will be accomplished primarily by Park Forestry personnel. Timber will also be felled and removed by a private contractor to expedite removal of high hazard backlog trees. Once this backlog is removed, the Park Forestry Crew will be able to fell trees. Hazard trees will be sold as excess property or as firewood to the highest bidder.

E. Artifically revegetate construction sites and heavily impacted and developed areas where human impact impedes natural regenerative processes:

1. Plant Propagation and Revegetation Program

In natural areas, processes, such as fire and insect and disease influence death and regrowth of trees and shrubs. Developed areas, because of heavy human use and development, lack naturalness. Natural replacement of woody vegetation is nearly impossible because of disturbance caused by hazard tree removal. For example, as hazard trees are removed, a point is reached where a site may become undesirable. A propagation/revegetation program will be needed to revegetate

sites subject to construction activities and developed areas where hazard tree removal and human impact impedes natural regenerative processes.

Studies for approximately 1,000 acres of developed recreation areas will be conducted to determine past vegetation mosaic patterns and to project future conditions and use. Based on results of this research, a revegetation program will be conducted by transplanting desirable native species from nearby areas. A Park nursery will be established to provide a source of native species for revegetation projects. Prior to any construction activities, a plan for revegetation of the site will be made. The plan will be carried out after construction is completed and before the next growing season.

F. Judiciously clear vistas

1. Vista Clearing

Because of fire suppression and regeneration of road cuttings, plant succession along roadways has blocked many scenic vistas. The objective of vista clearing along roadways is to maintain and/or improve scenic vistas. This is expected to improve visitor enjoyment and awareness of park resources. Vista clearing along roadways will be accomplished following standards for hazard tree removal.

II. Fire Management

The fire management program expanded with approval and implementation of a Fire Management Plan in June 1979. Objectives of the fire management program are to:

A. Restore fire to its natural role to the maximum extent possible, allowing natural fire in certain zones.

1. Continue to allow naturally occurring fires to burn unimpaired within the designated 681,000-acre Natural Fire Management Zone.

2. Naturally occurring fires within this zone are continually monitored and suppression or containment action implemented if the fire threatens to burn beyond zone boundaries or produces an unacceptable amount of smoke.

3. The effects of natural fire on vegetation, fisheries, wildlife, water quality, air quality, and other ecosystem elements will be determined.

B. Expand practice of using prescribed fire in certain zones.

When weather conditions permit, prescribed fire will continue to be used on about 181,000 acres outside the Natural Fire Management Zone within the following guidelines:

1. Ignite only specifically delineated areas.

2. Prior to burning, a detailed prescribed burn plan for each burn will be prepared by fire qualified personnel and approved by the Superintendent (see Fire Management Plan and Prescribed Burning Guidelines).

3. Burn only during periods when smoke will be carried away from populated areas and over the Parks where it can dissipate. All required burning permits will be obtained prior to prescribed burning and all restrictions observed. No burning will be done below an inversion layer or in the absence of suitable smoke dispersal away from sensitive areas without a variance. Smoke management will be part of every prescription.

An inversion occurs in the Central Valley during the fall, which will preclude the occurrence of prescribed or natural fires below 3,000 to 4,000 feet during this period of poor air movement and smoke dispersion without a variance. The remainder of the year tends to have unstable atmospheric conditions and therefore good smoke and pollutant dispersal.

Various drainages and steep topography of the Parks also serve to disperse smoke from fires which occasionally occur. Diurnal upcanyon winds mix and blow smoke east where it is dispersed. Smoke may settle into canyons at night, but readily moves upcanyon during the day; like air currents, smoke and urban pollution tend to flow up drainages.

Since the role of smoke in the natural system is not clearly understood, effect of fire suppression's removal of it from the system is not known. Certain species in the Parks have likely adapted to its presence and have perhaps used it to their benefit, as they have used fire. Pathogen inhibition from exposure to smoke has been reported by Parmeter and Uhrenholdt (1974). Particulates produced by fire may also perform some filtering and cleansing effect on air quality.

Figure 3

FIRE MANAGEMENT ZONES

SEQUOIA & KINGS CANYON NATIONAL PARKS

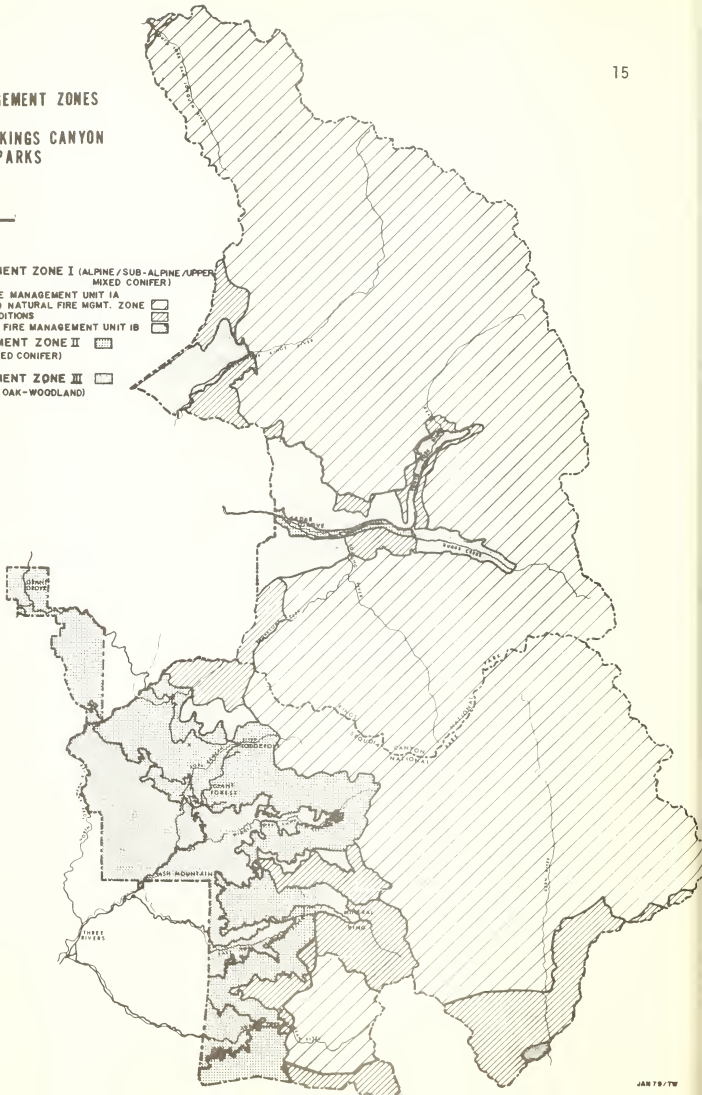
LEGEND

FIRE MANAGEMENT ZONE I (ALPINE/SUB-ALPINE/UPPER MIXED CONIFER)

NATURAL FIRE MANAGEMENT UNIT IA
PRE-1979 NATURAL FIRE MGMT. ZONE
1979 ADDITIONS
CONDITIONAL FIRE MANAGEMENT UNIT IB

FIRE MANAGEMENT ZONE II
(SEQUOIA-MIXED CONIFER)

FIRE MANAGEMENT ZONE III
(CHAPARRAL / OAK-WOODLAND)



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4. Inform the public and other land management agencies before burning and later on progress of burning.

C. Continue to suppress fires not contributing to fire management objectives:

1. Suppression will be directed toward achieving control with minimum natural resource damage.

2. All suppressed fires of Class C or larger size (more than 10 acres) or natural fires requiring some degree of containment will be inspected by a resource management technician who will identify sources of environmental impact caused by the suppression action. Obliteration and rehabilitation of all fire lines, camps, and helispots will be effected before control forces are released if possible. In addition, all cut stumps will be treated by borax, and all felled trees will be bucked to lay flat on the ground and limbed with all slash either burned or lopped and scattered.

3. Helispots will be constructed only when other means of transportation are clearly not feasible. No helispots will be pre-constructed for possible future use.

III. Human Impact on Sequoia Groves

A. Implement development concept plans for Lodgepole-Giant Forest and Grant Grove which provide for the removal of visitor and concession facilities, except selected interpretive aids, from the sequoia groves:

Special provisions will be made for obliteration of secondary service roads, restoration of obliterated roadbeds to their natural state, and protection of footpaths from excessive soil compaction.

B. Continue to restore sequoia groves to natural conditions:

This will involve the use of prescribed burning and cutting, piling, and burning shade tolerant trees such as white fir, that are overly abundant because of fire exclusion. Cutting, piling and burning will be done only in heavily visited groves. Prescribed fire will be used in remaining groves.

FIGURE 4 Before prescribed burning, this giant sequoia-white fir forest had been protected from fire for about 50 years. The unnatural and hazardous accumulation of litter, debris, and saplings is evident.

FIGURE 5 After prescribed burning, the area is clear of much of the debris and undergrowth. Increased light penetration to the forest floor will encourage wildflower growth, and visitors to the area can move about with ease.

IV. Wildlife Management

A. Manage native animals as healthy, self-supporting populations and give special protection to threatened and endangered wildlife species:

1. Black Bear Management

Black bears *(Ursus americanus)* are an important wildlife resource widely distributed through these Parks. Most of the Parks' bear population lives remote from developed areas, subsisting on natural foods. In the vicinity of developed areas, availability of human food has permitted unnatural feeding habits to develop in wild bear populations.

With the advent of development in the Parks, unnatural food became available to the bear from several sources. In addition to intentional feeding by visitors, garbage cans with easily removable lids were readily available. Morning garbage collection schedules left an all-day accumulation of debris for the nocturnal bears. Visitors, uninformed about proper food storage left unattended food on the campgrounds and the concessioner lodge area.

The availability of human food has led to conflicts between bears and visitors, resulting in damaged property and personal injuries. It is the goal of the Bear Management Plan to minimize availability of unnatural food sources to bears and to restore their populations to natural cycles.

Management objectives are:

a. To minimize bear/human relationships and conflicts.

b. To maintain populations of black bears at biologically sound levels under natural conditions as part of the native fauna of these Parks.

c. To provide information to visitors to help them understand and appreciate the black bear's role in a natural environment.

To achieve these objectives, a five-phased program will be conducted that includes (1) removal of unnatural food sources; (2) public information and education; (3) enforcement of regulations regarding feeding of wild animals and proper food storage; (4) implementation of bear handling procedures which

are humane, as well as biologically sound; and (5) continuation of a research program on the black bear population dynamics and ecology and monitoring of bear-human relationships. The Bear Management Plan provides further details.

2. Deer Management

The objective of the deer management program is to maintain and/or restore a mule deer *(Odocoileus hemionus)* population and range to natural conditions.

Mule deer *(Odocoileus hemionus)* populations, are subject to wide cyclic fluctuations, depending upon climatic factors and available forage. The number of deer in these Parks is less than 50 percent of the level 20 years ago. During the 10 year period starting with 1955, an average of 92 deer were taken each year by direct reduction (no reduction in 1963 due to local protest). In the six year period beginning with 1964 an average of 15 deer were taken each year in direct reduction. These latter reductions removed animals unnaturally concentrated by the availability of human food. These deer became diseased, dangerous, and placed undue stress on available natural vegetation. Since that time, statewide reports of declining deer numbers have been of general concern and thus no reductions have been attempted in these Parks. Such abrupt changes in management philosophy exemplify the lack of complete understanding of the status of deer populations.

Fire suppression in the past years altered vegetative communities, limiting available forage and reducing deer range. The natural role of fire in developing and maintaining vegetative mosaics and their availability as browse material is important in maintaining natural deer populations. Deer range should be examined for the effects of fire as it is returned to its natural role.

Park deer herds will be monitored as to population size, migration patterns, habitat utilization and habitat condition. Manipulation of the population, if required, will be carried out in cooperation with the California Department of Fish and Game.

3. Threatened and Endangered Wildlife Program

The condor, *(Gymnogyps californianus)*, and the southern bald eagle, *(Haliaetus leucocephalus leucocephalus)* are the only species classified on the Federal list of Threatened and Endangered Wildlife.

Both species are transients in the Parks and do not nest here. They

are occasionally sighted in the southwestern portion of Sequoia National Park.

An up-to-date record will be maintained of all sightings. If a resident population is found, consultation will be made with U.S. Fish and Wildlife Service to determine measures needed for preservation of the population in the parks.

4. Vector Control

Woodrats *(Neotoma cinerea)* enter older dwellings in residential areas where, by nest-building and related activities, they damage structures and present a health hazard with their accompanying parasitic fleas, lice and kissing bugs *(Triatoma protracta)*. These parasites are vectors of disease organisms which infect man. Accumulated litter and chewed electrical insulation can be a fire hazard. These conditions are found in older buildings which were not constructed by modern standards.

Woodrats will be controlled when they are present in dwellings. Treatment of individual dwellings will be carried out with an approved rodenticide. As funds become available dwellings will be upgraded to a standard prohibiting access of woodrats.

Ground squirrels, *(Citellus beecheyi)* may serve as a reservoir for plague, *Pasteurella pletis*. Fleas carry the disease from squirrels to men.

A method of ground squirrel population census will be developed to show annual population differences in a given area and comparison between populations in developed areas (e.g., campgrounds) and populations in comparable habitat in undeveloped areas. When reduction seems necessary by reason of identified problems such as the presence of plague in developed areas, burrows will be treated with an approved rodenticide and insecticide. Treatment should insure that contact will be limited to target pests.

5. Exotic Animal Control

An exotic beaver *(Castor canadensis)* was introduced into U.S. Forest Service lands adjacent to Sequoia National Park in the 1930's. In subsequent years, it extended its range into the Kern Canyon portion of the Park. Recently, the animal has had a significant impact on the area through such activities as cutting of trees, building of dams, and subsequent flooding of meadows. In past years, such control techniques as shooting, blasting and burning of dams, and trapping have been attempted. Trapping is

the most effective, and in 1970 and 1971, a trapping program, in conjunction with U.S. Fish and Wildlife Service was effective. These control activities have attempted to maintain the population at a low enough level to minimize disturbance while at the same time counteracting it with soil and moisture conservation and restoration activities. Despite cooperative efforts between the National Park Service, the U.S. Forest Service, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game, total elimination of the beaver is now considered impractical. It is very difficult to reduce the population below a certain threshold level and, even if this was accomplished, the beaver would always be able to return from the populations now existing on adjacent Forest Service Land.

Control activities will aim at maintaining beaver populations at or below a level considered tolerable with the natural resources. This is currently estimated at a total of approximately 12 breeding pair. This will be accomplished by trapping whenever the populations rise above this level. Additional action, such as prescribed burning, will be used to keep the river channel clear of logs and other debris. An evaluation of current and past impact of the beaver on the natural habitat, as well as continuing evaluation of the control actions will be conducted.

Populations of other species of exotic mammals and birds (including wild turkey, chukar, and starling) have been found in these Parks. Current distribution and status of these species, including their ability to maintain a self-sustaining population is unknown.

An inventory of the distribution and ecological impact of all other species of exotic birds and mammals in the Parks will be conducted. Recommendations will be made regarding possible reduction and elimination of these species.

V. Hydrobiological Resource Management

Preserve, restore, and maintain endemic species and native aquatic habitat whenever possible:

A. Fisheries Management

In the future, restoration and maintenance of natural aquatic environment will likely take precedence over recreational fishing. Fish stocking in other areas is being phased out and where it still occurs, only native species are used.

FIGURE 6 Blister rust cankers on white pine.

FIGURE 7 Beaver damage on the Kern River.

FIGURE 8 Hazard tree failure.

A cooperative study between California Department of Fish and Game and National Park Service to evaluate biological, recreational, and economic considerations involved in aquatic resources management was conducted in 1977. This study surveyed 137 high elevation lakes to survey status of the fishery in the lakes. Sixty percent of the lakes would maintain a self-sustaining trout population without stocking.

This study as well as similar studies at Yosemite and Lassen National Parks is being evaluated as to the continuation or discontinuation of trout stocking until a decision is reached. Artificial stocking of fingerling trout will be continued at no higher than the 1974 levels in selected high elevation lakes. Studies on the condition of park waters and fishery management options will be continued. National Park Service is currently reviewing its aquatic resources management policies and will soon be revising them.

B. Threatened and Endangered Fishery Program

A short section of Soda Springs Creek in the Kern River watershed contains perhaps the last surviving genetically pure individuals of a subspecies of golden trout *(Salmo aquabonita)*. This subspecies was listed as a threatened species in 1977. A management plan was implemented in 1977 with the California Department of Fish and Game, U.S. Fish and Wildlife Service, and U.S. Forest Service to restore the Little Kern golden trout to its former range in the Little Kern watershed. As part of this plan non-native rainbow, brook trout, and rainbow/Little Kern golden trout hybrids will be eliminated from Soda Spring Creek to provide for the expansion of the golden trout. This action will deprive park visitors from a fishing experience in this immediate area.

VI. Kaweah Diversion

A. Conduct studies to evaluate the environmental impacts of the Kaweah Diversion:

Since 1913 water has been diverted from the Marble and Middle Forks of the Kaweah River for use in generation of electricity. The diverted portion of river extends four and one-half miles upstream from Sequoia National Park boundary to the vicinity of Potwisha Campground.

This four and one-half mile stretch of the Kaweah River is one of the few protected examples of unique foothill riparian ecosystem. Studies conducted by National Park Service personnel in 1963 resulted in negotiated restrictions on water use. A minimum release established at that time is still in effect. During the months of July and

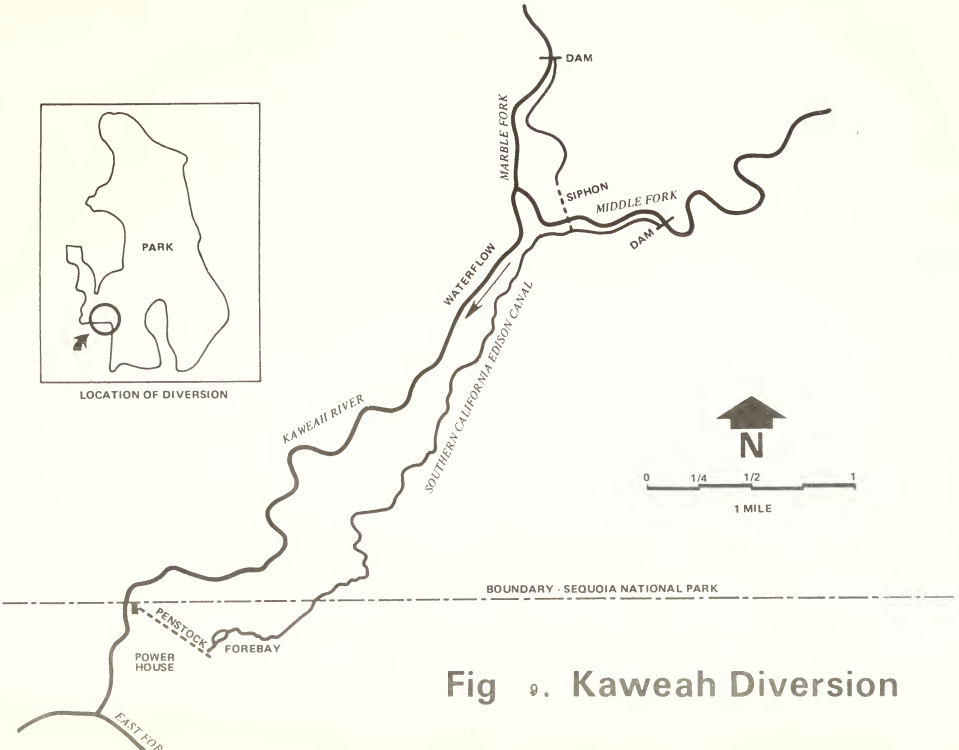

Fig 9. Kaweah Diversion

August, a minimum release of 20 cubic feet per second is received and during September through December, a release of 11 cubic feet per second is allowed.

Cooperative studies conducted by National Park Service, Fish and Wildlife Service, and California Fish and Game Department personnel in 1973 show that aquatic habitat despite these required minimum releases, is still below adequate standards to sustain natural trout populations. Conclusions from the 1973 study indicate 40 cubic feet per second would be necessary to furnish spawning habitat, resting habitat(frequently occupied by suckers at lower flow rates) and cover to sustain reproduction and growth of native trout.

The Permit and Concurrent Federal Power Commission lines enabled the Southern California Edison Company to operate facilities until August 1974. In 1974 Congress approved a 10-year extension with the stipulation that the Park conduct whatever studies are required to assess impacts of the diversion on the Park. A contract study was started in 1979 and will be completed for Congressional review by 1984. Congress will then decide whether to extend or deny the permit.

VII. Meadow Restoration, Maintenance and Grazing

A. Continue to restore and maintain ecological relationships within meadow environments. Rehabilitate certain sites with efforts to reduce or neutralize human-caused erosion. In some areas, trails were located directly through fragile meadow vegetation and sod. This has been recently reduced in several locations through fence construction and land acquisition.

A number of drift fences exist throughout the Parks. Fences exist to prevent overuse and deterioration of Park resources. Drift fences also incidentally serve to prevent stock from moving long distances. No fences are permitted which hold stock in small limited areas except for six administrative pastures where stock is temporarily held to be ready for use in connection with administration of these Parks.

Some meadows are encroached by lodgepole pine. In the past, lodgepole pine were removed from certain meadows designated to be maintained for scenic considerations. In some areas, lodgepole is killed by snow avalanches, fire, and other natural causes. The ecology of pine encroachment has been studied and is not completely understood. No major lodgepole removal has been accomplished for some 10 years reflecting the lack of information.

Actions to solve the above problems include:

1. Continue meadow stabilization and maintenance through construction and maintenance of check dams to correct erosion and maintain fences to manage grazing.

2. Remove all fences not used for meadow maintenance or grazing control.

3. Trails which presently pass directly through meadows will be rerouted through more stable soils and less fragile vegetation. The abandoned trail sections will be rehabilitated and the affected environment restored to its original condition. Meadow profiles will not be restored by the use of foreign material, i.e., abandoned eroded trail ditches in meadows will be filled to duplicate the original soil and vegetation type and profile.

4. Continued moratorium on removal of encroaching lodgepole pine until specific reliable information is available on the role of lodgepole pine in relation to mountain meadows.

B. Grazing

1. Continue present grazing regulations and further revise regulations based on pack stock carrying capacities:

   a. Pack stock carrying capacities, translated into estimated maximum grazing days, will be determined for each grazing area which can be utilized by stock without damage. These carrying capacities will form the basis for the allocation of stock use. Permits for stock use will be required. Grazing use will be accumulatively and currently recorded for all the rated use areas and summarized and plotted on an atlas by area.

      Estimated maximum grazing days allocated to areas will also be shown on the atlas. In this way, areas approaching their grazing day limitation and areas which may be relatively unused will be apparent. Once an area reaches its grazing limit, it will be closed and alternate grazing areas suggested.

C. Cahoon Meadow

1. Stabilize and restore Cahoon Meadow to approximate more natural conditions:

a. Monitoring of resource deterioration in Cahoon Meadow, including possible effects on downstream aquatic resources will continue. Stabilization and restoration of the meadow will be conducted when funds become available.

VIII. Roads and Trails

A. Stabilize and naturalize abandoned roads and trails by established soil and moisture conservation and engineering techniques to prevent the development of erosive conditions and to facilitate their return to a natural condition:

1. Within these Parks are approximately 113 miles of surfaced roads, 63 miles of dirt roads, 35 miles of surfaced trails and 755 miles of unsurfaced trails. Part of the road system and much of the trail system was established prior to the time when there were any construction standards. As a result, roads and trails have been designed and constructed to a variety of standards. Where trails were built before the establishment of the Parks, it is doubtful if any standards were used.

2. All abandoned roads and trails will be treated by established soil and moisture conservation and engineering techniques to prevent the development of erosive conditions and to facilitate their return to a natural condition as rapidly as possible. Such practices include the construction of water turning devices, the loosening of compacted surfaces to facilitate natural vegetative regeneration and possible seeding with native species. Before any new trails or roads are constructed, those to be replaced and abandoned or not maintained, will be treated as indicated in "1" above. Where feasible, all roads (other than the Generals Highway) within giant sequoia groves will be abandoned and the surrounding ecosystem rehabilitated. As physical developments are removed from giant sequoia ecosystems, access roads will be removed and returned to a natural condition.

3. All trails abandoned (not maintained) in the past will be treated as in "1" above. All system trails and roads will be maintained to prevent erosion of those developments and adjacent affected areas. All trail maintenance and soil and moisture

conservation personnel will be trained in approved methods and techniques for rehabilitating and obliterating closed trails.

4. Resource Management will perform continuing surveys of existing roads and trails to identify detrimental environmental impacts caused by the design, construction, or maintenance practices. As impacts are identified, plans will be made and implemented to eliminate the causes of the impacts and remove their effects where feasible.

5. The required "professional ecological determination" referred to above will be performed at the Park level prior to design and construction of all roads or trails or trail relocation activities.

IX. Human Use of Wilderness

A. Continue rationing visitor use at trailheads and, further, refine limits based on carrying capacity studies:

1. Establish a criterion for rating impact in terms of the degree of deflection (impact) and establish controls on use of such areas to return them to standard (normal) environmental conditions.

2. Monitor the condition of impacted areas. When they improve to an acceptable environmental standard, reissue permits on a basis which will prevent use from lowering conditions below the standard. Implement a flexible permit system designed to retrieve use information by specific sites, to prevent impact by controlling the number of permits issued for impacted areas; and, to adjust visitor use to provide for use of non-impacted locations, i.e., minimize impact in relation to use.

3. Establish a wilderness use educational program by which respective wilderness users can be exposed to a short program pointing out the ways which visitor behavior can ameliorate resource damage. An extension of this action would be to establish a requirement for the exposure to such information as a requirement for issuance of a wilderness permit.

4. Impose rationing only as a last resort after the demand for use exceeds management's facility to adjust and direct that use, including onsite visitor education programs without resources deterioration.

X. Cave Management

Sequoia and Kings Canyon National Parks contain over 75 known caves including some of the largest and most spectacular in California. In Caves of California, Halliday described 21 Park caves including Crystal, Clough, Lilburn, and Soldiers Caves. Each of these caves is unique and should be protected at all costs.

The complexity of the caves in these Parks as well as access to them, deterioration by visitor use, vandalism, litter, search and rescue, and other problems, makes the cave resource one that is very difficult to manage. The primary objective for the management of caves in these Parks must consist of managing the resources of the caves to minimize any alterations of the existing biologic and geologic features.

In the past, Crystal Cave has experienced heavy visitation. In 1973, 44,871 persons visited the cave. During the summer season, guided tours are offered as part of the Park Interpretive Program every half hour during the day, seven days a week. Attendant developments inside the cave include handrails, cemented walkways, and lighting. The management of Soldiers Cave has been oriented toward visitor safety. Technical climbing gear and more recently, cave experience, have been required before entrance was allowed. No other cave management policies exist in these Parks. In an effort to enforce the limited access to Crystal and Soldiers Caves, each cave has been provided with a locked gate. To date, little attention has been given to cave management for protection of the cave resource. The fact that a cave might be irreversibly damaged by every human visit presents an additional problem.

Each visit to a cave can cause several types of damage. The brown stains of the formations found in Soldiers Cave as well as in several other Park caves were caused by dust from the floor stirred into the air and settling on the formation or the rubbing of muddy or dirty clothes against the formations. By merely touching the formation, human body oil permanently stains a speleothem. Human body waste causes a special problem. The waste is sensually displeasing and in a cave is slowly decomposed. Vandalism is another serious problem. A speleothem that required thousands of years to form is very brittle. One careless moment or one thoughtless act disallows countless others the chance to view the formation's priceless beauty. These types of damage can be eliminated in our cave resource only with adequate protective management.

A Management Policy Memorandum of Carlsbad Caverns National Park states:

> "Protection and enforcement of the rules and regulations pertaining to the preservation of natural features should, and must, be particularly strong in this Park where these features are dead and irreplaceable."

Any damage done to a formation in a cave is permanent. There is far too much evidence of such damage in the many caves in these Parks.

Clough Cave demonstrates the result of vandalism. This once beautiful cave is now no more than a hole in the ground. Almost all the breakable formations are destroyed. The flow formations and columns are mud stained. The damage is irreversible. Halliday (1962) says of Clough Cave, "Because of its ease of access, vandalism has left mere vestiges of its former beauty."

Only strong protective management will help to preserve remaining cave resources.

The following actions will be taken to manage the caves in Sequoia and Kings Canyon National Parks:

1. A thorough inventory of all Park caves and cave resources will be conducted to provide a basis for future management decisions.

2. All Park caves, except Clough and Crystal, will be closed to general public access until recommendation can be made on management policies for each cave. Access will be allowed only for valid scientific or exploratory purposes as determined by the Superintendent. An application for access must be in advance in writing and include justification for the proposed entry. Readily accessable caves, including Lilburn and Paradise Caves, will be provided with locked gates. The entrance location of caves not readily accessable will not be public information.

3. Clough Cave, having been thoroughly and irreversibly vandalized, is excluded from the above restrictions and will continue to be open to free public access.

4. Crystal Cave will continue to be a part of the Park Interpretive Program. Visitors will be offered a guided tour during the summer months. The maximum group size will be 40 persons (a number estimated by Park Interpreters to be the maximum which can be adequately handled by guides without risking damage to the cave resource). An emphasis will be placed on educating the public to the importance of conserving the cave resource.

XI. Air Quality Management

Background

Both Parks were established largely on the basis of vistas reported by early

explorers such as King (1871). These reports also formed the basis for the widely held view that frequent Indian or lightning fires kept mixed conifer forests open and fuel loads low.

The scenic resources set aside in the Parks by Congress should be managed to maximize clean air over their entirety for viewing by visitors. To appreciate the magnificent resource it must be seen, and pollutants on occasion impair this view and appreciation of our natural heritage. Importance of air quality in formation of the Parks can be seen in the following:

Letter by Franklin K. Lane, Secretary of the Interior to Senator H. I. Myers, Chairman, Committee on Public Lands, U.S. Senate, May 15, 1918.

> "Scenically this country is unexcelled, of its kind, in the United States." Commenting on S. 2021 adding certain lands to Sequoia National Park.

Minority views to accompany S. 2021 passed by Senate, January 16, 1919, to add certain lands to Sequoia National Park.

> Senator Phelan, ". . . constitutes a total supreme scenic magnificance. It would make a national park unexcelled even in America, for sublimity and unequaled anywhere for rich variety. It is penetrated by trails, and affords, with its three foaming rivers, its thousands of streams, its hundreds of lakes, its splendid forests, occasional meadows, castellated valleys, inspiring passes, and lofty glacier-shouldered summits, the future camping-out resort of many thousands yearly."

April 16, 1939, letter by Harold L. Ickes, Secretary of the Interior in letter to Hon. Rene L. DeRouen, Chairman, Committee on the Public Lands, U.S. House of Representatives.

> "The purpose of the Act (H.R. 3794) is to conserve permanently in its natural condition, as a national park for the benefit and enjoyment of the people, one of the most famous scenic areas in the United States." Kings Canyon National Park.

If natural fires did occur, with frequencies believed to be about four to 20 years in the mixed-conifer type (Van Wagtendonk, 1972; Biswell, 1972; Kilgore and Taylor, 1979), then localized smoke, and therefore occasional visibility impairment, must also have been a natural part of the system as well. The removal of smoke may have had deleterious consequences, as did the removal of fire, as a result of suppression policies in this type.

Wood smoke rarely, if ever, contains nitrogen oxides or sulphur dioxide (Hall, 1972), and its hydrocarbons tend to be chemically saturated and unimportant to the formation of photochemical smog (Murphy, 1972). Moreover, far more hydrocarbons are produced by pine forests as terpenes which give a bluish tint to the air (Cramer, 1974). Also, smoke seems to inhibit various forest pathogens (Parmeter and Uhrenholdt, 1974).

Intense fires can produce ten times more particulates than low intensity fires (Coleman, 1975) since they consume much more green vegetation and woody fuel. The potential threat of wood smoke is from the volume of fine particulates, which do pose health hazards to people with respiratory problems. For this reason smoke from prescribed fires will be managed to minimize impact on developed sites.

Monitoring and Management of Air Quality

1. Collect data to establish present air quality and to locate sensitive areas and resources in the Parks.

   Magnitude of impairment resulting from urban sources is unknown, nor is the impact of this pollution on the resources of the Parks understood. Moreover, importance of smoke from naturally occurring and prescribed fires to resources, and its proper place in management strategies, has not been defined.

   Projects which quantify impact, temporary or permanent, of urban pollution and of smoke from all types of fire will begin to establish a data base from which intelligent management strategies can be formed. Monitoring stations will be set up, air quality monitored, and true impact of smoke and urban pollution on the Parks' resources established. Such stations will be positioned inconspicuously so they will not detract from visual experiences of visitors. Smoke from management fires occurring within the Parks will be studied objectively, for it may be revealed that temporary impairment of visibility is more than compensated for by benefits to the system. Smoke should not be unfairly judged until facts are in, as was the case with fire for many years until its true importance was shown.

   Sequoia and Kings Canyon National Parks have been designated as Class I under the provisions of the Clean Air Act Amendments of 1977, P.L. 95-95, and will require protection if their air quality is to remain as natural as possible. Air quality will be maintained within State and Federal requirements. Three means will be required to accomplish this goal:

First, the Parks will continue to prevent wildfire as much as possible, mitigating its sometimes disastrous effects on resources. Towards this end, prescribed burning must be used to reduce fuel hazards and to begin to restore fire to its natural role. It will be performed when smoke management conditions are favorable and meet prescribed conditions. The temporary visibility impairment which results must be accepted as part of a process which will restore and perpetuate natural conditions.

Second, urban pollution production is independent of Park jurisdiction, and its levels and impacts on Park resources must be controlled by other agencies. Sequoia and Kings Canyon National Parks will monitor levels and effects as much as possible to aid in establishing control levels, and must be involved in the planning process of new installations that could cause a deterioration of the Parks' air quality.

Third, natural fires will burn whenever they meet management objectives. the role not only of fire but also of smoke must be allowed to continue to function as unimpaired as possible. Further study on importance of these elements in the system as a whole will also be peformed.

Ozone is already known to be causing mortality within the Park in yellow pine species. Ponderosa and Jeffrey pines are particularly sensitive to ozone and could serve as indicator species. Monitoring is necessary if a repeat of the mortality in San Bernadino Mountains is to be avoided. Acid rain also needs to be studied. For example, the influence of urban pollution on Indian pictographs is not known, but SO_2, in the form of H_2SO_4, may have a deleterious impact on them. Pictographs are an important link to the past and should not be allowed to fade because of urban pollution. The following actions will be implemented:

a. Establish year round monitoring stations to record changes in background pollutants and visibility impairments (e.g. terpenes from pine forests, fog, valley dust and smoke, urban pollutants) and the influence of various meteorological conditions on their dispersal.

b. Monitor the impact of all types of fire on these stations, especially particulate levels and visibility.

c. Locate major natural trajectories of smoke dispersal from natural and prescribed fires for various times of the year as well as the sensitive targets (roads, campgrounds, towns, etc.) along them.

d. Monitor and study the effect of urban pollutants and smoke from all types of fire on the natural resources, particularly in the mixed-conifer type. The natural role of smoke in the system should be established.

e. Establish maximum acceptable levels of pollutants for sensitive targets and for selected natural resources, and compare with legal standard.

f. The impact of ozone on coniferous species will continue to be monitored.

g. Wet fall-dry fall monitoring stations will be established to monitor acid rain.

XII. Water Resources Management

A. Water Quality

1. Analyze, classify, and monitor water quality in all Park waters.

On October 18, 1972, Congress enacted Public Law 92-500: "Federal Water Pollution Control Act Ammendments of 1972." On December 15, 1977, Congress amended the 1972 Act by passing Public Law 95-217: "Clean Water Act of 1977." The Law states that "Each. . . agency . . . of the Federal Government having jurisdiction over any property . . . shall be subject to, and comply with, all Federal, State, interstate, and local requirements. . . "

As an outcome of the above Laws, a Memorandum of Understanding between the Service and Environmental Protection Agency has been established. This requires an analysis of present park waters and a resulting classification of these waters for future uses. Such classifications should be in harmony with water classifications established by the State, acting in response to the above laws. Future monitoring to insure nondegredation of established water standards will be necessary. A Water Resources Management Plan will be developed and implemented to enable the Park to monitor its water quality in major water sources, detect changes in water quality in major water sources, and monitor quality of water leaving the Park. U.S. Geological Survey has been conducting water quality surveys for two years in the Parks. This data will be used in the Water Resources Management Plan.

B. Snow Surveys

The Park is a cooperator with California Cooperative Snow Surveys

headed by the Department of Water Resources, Resources Agency, State of California in monitoring five snow courses within the Parks. Measurements are taken from January to April by Park personnel. Measurements include average snow depth and water content.

XIII. Research

A. Initiate or complete the research studies and inventories summarized below:

1. Wildlife studies are proposed regarding black bear behavior and ecology, rare, endangered and threatened mammals and birds, the status of mule deer, fisher, and wolverine populations, the effects of fire on wildlife, and the ecological roles of extirpated species, including the feasibility of reintroducing bighorn sheep into Mineral King. Inventories of small mammals, birds, reptiles, amphibians and invertebrates are also lacking.

2. Vegetation studies will be completed or initiated on the role of lodgepole pine encroachment in mountain meadows, endangered and threatened plants, exotic plants, and techniques to maintain healthy forest communities in the Parks campgrounds. Basic descriptive inventories of the Parks plant communities as well as studies of giant sequoia pathology are also needed.

3. Continuing studies of chaparral, grassland, and sequoia-mixed conifer fire ecology are proposed as well as effects of fire and smoke on forest diseases, soils, vegetative succession, and wildlife. Studies will also be initiated on fire dynamics of subalpine forest types.

4. Studies will be implemented on effects of air pollution on vegetation and aquatic systems.

5. Proposed research regarding human use includes development of criteria to evaluate human impact on wilderness environments and techniques for evaluating and rehabilitating backcountry impact.

6. A computerized system for storage and retrieval of basic resources information on plant, animal, aquatic and geological resources of the Parks will be developed.

7. Additional research needed includes an inventory of lakes and streams, soil-type-mapping, study of glacial advances and an evaluation of cave resources.

RELATIONSHIP OF THIS PLAN TO OTHER PLANS AND PROJECTS

The General Management Plan provides information concerning the purpose of the two parks, their resource values, their relationship to the surrounding region, objectives of management, land classification, concepts of visitor use and interpretation, and an overall plan for their management and development. A Statement for Management, which is a part of the General Management Plan, was approved on July 27, 1976, and contains management objectives and planning constraints.

Action Plans describe in detail how concepts in the General Management Plan are to be accomplished. In addition to the Resources Management Plan, other Action Plans include:

1. A Wilderness Proposal for Sequoia and Kings Canyon National Parks was submitted to Congress in 1971 and has yet to be acted upon.

2. A plan for the Management of Backcountry Use was revised April 27, 1976, and is to be rewritten in 1981.

3. A Fire Management Plan was approved on June 29, 1979, and will be revised annually.

4. A Bear Management Plan was approved in February, 1979, and will be revised annually.

5. The broad Interpretive Prospectus for these Parks was approved July 1971 as was the specific interpretive plan for Lodgepole. Specific interpretive plans for other areas of the Parks have yet to be prepared.

6. Development Concept Plans concentrate on developed areas, showing circulation, allocation of space, and utilities networks. They include descriptions of proposed developments, their function and scope, and their relation to the site. The Development Concept Plan for Cedar Grove was approved July 20, 1976.

Together, these various plans will provide a detailed description of the management and design directions to be pursued. They are, in turn, translated into legislative, public use, management, and construction programs.

To date, only the Wilderness Proposal, Development Concept Plan for Cedar Grove, and Draft DCP for Giant Forest-Lodgepole have borne the scrutiny of public review. The recommendation to remove facilities from sequoia groves, which is part of the Resources Management Plan, and is integral to the Giant Forest-Lodgepole DPC, received favorable comments from the public.

A Comprehensive Management Plan for Mineral King was written in draft form for further public review in 1980. Management of the deer herds and fisheries of Mineral King are part of the continuing management program and both sensitive issues.

Since private land and lands administered by either the U.S. Forest Service or Bureau of Land Management border the Parks on all sides, their management objectives and land use significantly influence effectiveness of proposed actions within the Parks. An ongoing dialogue with neighbors continues as the Superintendent plans additional management programs.

Sequoia and Sierra National Forests have jointly proposed the Monarch Wilderness Area for designation under the Wilderness Act of 1964. As the proposed area abuts the proposed Park wilderness area near Tehipite Valley, its inclusion in the wilderness system will increase the total amount of uninterrupted wilderness available to the public.

The Mono Plan, an interagency plan for cooperative management of the east side of the Sierra, is presently being developed. A portion of this document will assist in the administration of backcountry management proposals and cooperative protection of California bighorn sheep in both their summer range within the Park and winter range in the Inyo National Forest.

The Bureau of Land Management has drafted management objectives for the Kaweah Planning Unit covering BLM administrated lands bordering southern and western portions of Sequoia National Park. While the Kaweah deer herd finds most of its summer habitat within the Park, it has been estimated that as much as one-third of the herd uses adjoining BLM lands for winter range. The Park has expressed its desire to cooperate in the mutual protection of the Kaweah herd and its habitat. Depletion of the winter range by excessive cattle grazing on BLM leased land could detrimentally affect the herd.

The North Kings Deer Herd Advisory Council is an interagency body of wildlife managers concerned with the study and protection of cyclic deer populations. Representatives of the Parks participate in the activities of this Council. Any significant findings will be incorporated into the Natural Resources Management Plan.

A mutual aid fire suppression agreement exists between the National Park Service, U.S. Forest Service, Bureau of Land Management, and California Division of Forestry. It provides for cooperative response to fires occurring near the boundaries of Sequoia and Kings Canyon National Parks. The fire management actions proposed do not affect this agreement.

It is important that this proposal retain its flexibility so that as programs and land uses for surrounding areas are developed and implemented, resource management within the Parks can determine and mitigate any impact on adjoining Park ecosystems.

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